

A. G. KALASHNIKOVON SOME TYPES OF PULSATIONS OF THE GEOMAGNETIC FIELD  
AND EARTH'S CURRENTS ARISING SIMULTANEOUSLY ON THE  
U.S.S.R. TERRITORY.

The short-period pulsations of the Earth electromagnetic field registered at the IGY high-sensitive stations are likely to be a superposition of different kinds of pulsations the sources of which may lie in the upper atmosphere, ionosphere, in the Earth's crust and deeply inside the Earth. To find out the origin of certain types of short-period pulsations it is reasonable to give a thorough investigation to types of pulsations characterized by definite indications. We have selected the pulsations of the geomagnetic field and those of the Earth's currents having the similar form and simultaneous rise and more or less equal period. The form of pulsations of the Earth's currents is, as a rule, different from that of the geomagnetic field as  $H_z$  is recorded in the geomagnetic field and  $\Delta E_x$  and  $\Delta E_y$  in the Earth's currents, which are derivatives of  $H/t$  in time if they arise from induction.

We have subjected the records obtained at the USSR stations to deep consideration and found out different types of pulsations almost simultaneously arising throughout the territory which extends from  $39^\circ$  to  $160^\circ$  E. and from  $42^\circ$  to  $68^\circ$  N. The territory comprises the following stations:

Borok /  $\varphi = 58^\circ 2' N$ ;  $\lambda = 38^\circ 58' E$ ;  $\Phi = 52^\circ 53'$ ;  $\Lambda = 123^\circ 20' /$ .  
 Lovozero /  $\varphi = 67^\circ 58' N$ ;  $\lambda = 35^\circ 5' E$ ;  $\Phi = 62^\circ 45'$ ;  $\Lambda = 127^\circ 18' /$ ;  
 Petropavlovsk /  $\varphi = 53^\circ 06' N$ ;  $\lambda = 158^\circ 38' E$ ;  $\Phi = 44^\circ 24'$ ;  
 $\Lambda = 218^\circ 14' /$

The Crimea.  $\varphi = 44^\circ 50'$ ;  $\lambda = 34^\circ 04' E$ ;  $\Phi = 41.2^\circ$ ;  $\Lambda = 113^\circ 2'$

Here  $\varphi$  is a geographic latitude,  $\lambda$  is a geographic longitude,  $\Phi$  is a geomagnetic latitude,  $\Lambda$  is a geomagnetic longitude.

The pulsations of the geomagnetic field and the Earth's currents are recorded with a speed of the photopaper of 90 mm/hr. Such a speed being used, the start and finish of pulsations could be determined with an accuracy of 2 min.

- 2 -

During August, September and November of 1957 there were discovered nine types of pulsations; four of them refer to pulsation trains, three to microbays and two to impulses /after the end of the study four cases of March 1958 were added/.

The summary table /see table 1/ shows the start and finish of the pulsations by Greenwich and local time; the pulsation amplitudes are expressed in  $\mu$  and mv and periods in sec.

The station "Borok" is situated in the centre of the European part of the USSR; Lovozero is in the North, the zone of the most frequent aurora; Petropavlovsk is on the Pacific coast and the Crimean station lies on the peninsula 30 km. from the sea. The table gives the relation of the amplitudes of the geomagnetic pulsations arising of Lovozero, Petropavlovsk and the Crimea to those at "Borok". In all cases except one these ratios are larger than a unity in spite of the fact that the geomagnetic latitude of these stations are strongly different: "Borok" is  $60^{\circ}$  northward and the Crimean station is  $8^{\circ}$  southward as compared to Petropavlovsk. This accounts for the fact that in the centre of large continents the amplitudes of the geomagnetic pulsations are smaller than those at the coastal stations where the amplitudes are effected by the sea currents /this assumption to be specially investigated/.

The examination of the data given in the table shows that the amplitude distribution of the geomagnetic pulsations is independent of the local time. The pulsations of different amplitudes are equally often met at each station during the day time as well as at night. It means that pulsations arising simultaneously are hardly being shielded by the ionosphere and may be caused by the electromagnetic motions occurring beyond it. The most probable hypothesis for explanation of this fact is that the short-period pulsations and small amplitudes arising simultaneously in the geomagnetic field and those corresponding to them in the Earth's currents are caused by the Earth's passing through the Solar corpuscular streams. The Earth's passing through the corpuscular streams causes weak geomagnetic disturbances having, apparently, a worldwide character. It will be possible to verify it by using the material obtained at the

- 3 -

stations abroad during the IGY and to compare it with the corresponding characteristics of the Solar activity.